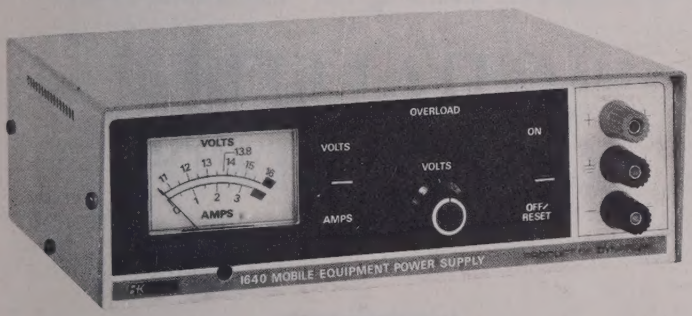
INSTRUCTION MANUAL

B+K PRECISION 1640

MOBILE EQUIPMENT REGULATED POWER SUPPLY



B+K PRECISION

Product of DYNASCAN CORPORATION
1801 West Belle Plaine Avenue, Chicago, Illinois 60613

INSTRUCTION MANUAL

For

Model 1640

MOBILE EQUIPMENT REGULATED POWER SUPPLY

DYNASCAN CORPORATION
1801 West Belle Plaine Avenue
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GENERAL DESCRIPTION AND SPECIAL FEATURES

The B & K-Precision Model 1640 Solid-State Regulated Power Supply is designed to power Citizens Band mobile radios, auto-radio/tape decks, marine radios, and related mobile equipment. Its use as an instrument for servicing mobile equipment is a criteria in its design.

FEATURES

- High DC output current, 3A continuous, 5A surge limited.

- Automatic delayed voltage shutdown prevents nuisance overload tripping due to high surge currents of CB transceivers keyed to transmit mode, energizing channel selector solenoids of 8-track tape decks, or charging high capacitive loads (inrush currents normally encountered when turning on CB transceivers, auto radios, etc.). The 5A surge limiter prevents damage to the power supply if overloaded by a short circuit.

- Lab-type voltage regulation – better than 0.8% from no-load to full-load with ±10% line variations. This eliminates voltage changes caused by load current variations such as those experienced when aligning RF power amplifiers or when varying the audio output of a receiver or tape deck.

- Wide-view, illuminated, 2-scale voltmeter/ammeter with expanded voltmeter scale, 11V to 15 VDC. EIA Standard Automotive Voltage (13.8 VDC) highlighted in red for convenient reference. Voltage and current metering functions selected by front panel switch.

- Continuously variable output voltage from 11.0 to 15.0 VDC, an indispensable feature for checking mobile radio performance over the full range of voltages encountered in 12V automotive systems.

- L.E.D. OVERLOAD indicator.

- 3 heavy-duty output binding posts: POSITIVE, NEGATIVE (both electrically floating), and CHASSIS GROUND.

SPECIFICATIONS (@ 25° C)

INPUT VOLTAGE:	117 VAC, 60 Hz.
DC OUTPUT VOLTS:	Continuously variable from 11V to 15V.
DC OUTPUT CURRENT:	0–3.0 amps continuous, 5 amps surge limited.
METER:	Voltmeter/Ammeter, pivot and jewel movement. Metering functions selected by switch.
VOLTMETER SCALE:	11V to 15.0V, ±5% FS. 13.8V, ±2%.
CURRENT SCALE:	0 to 3.0A, ±2% FS.
OUTPUT RIPPLE:	Less than 8mV RMS; 0–3.0A.
LOAD REGULATION:	Less than .8% voltage change from 0 to 3.0A, 11V to 15.0V.
LINE REGULATION:	Less than .8% voltage change at 3.0A output, with ±10% line variation.
SHORT CIRCUIT PROTECTION:	Voltage shutdown, manual reset. Surge current limited to 5A maximum.
DIMENSIONS:	3-1/16 H x 10" W x 8½" D.
WEIGHT:	8 lbs.

OPERATING CONTROLS AND INDICATORS

1. **POWER ON-OFF/RESET:**
   Turns on power and resets unit when shutdown by overload.

2. **VOLTS CONTROL:**
   Sets output voltage from 11V to 15 VDC.

3. **METER LAMP:**
   Lights when the Model 1640 is turned on.

4. **VOLTS/AMPS METER SWITCH:**
   Selects volts or current mode for meter (5).

5. **METER:**
   Meters output volts from 11V to 15 VDC. Meters output current from 0 to 3.0A.

6. **OVERLOAD INDICATOR:**
   Glows after overload and turns off when overload is cleared.

7. ⏚**TERMINAL:**
   Chassis ground terminal. May be connected to either POS. or NEG. output terminal.

8. 9. Output terminals, POS. (+) and NEG. (-) respectively.

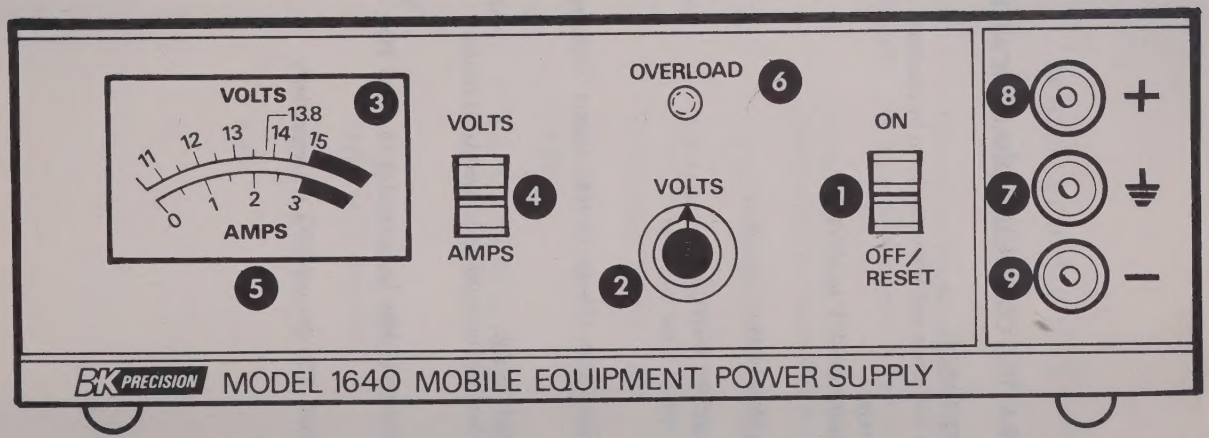


Fig. 1. Controls and indicators.

OPERATING THE MODEL 1640
(Refer to Fig. 1)

SAFETY PRECAUTIONS

A certain amount of danger is always present when working on electrical equipment; therefore, the user is cautioned always to familiarize himself as much as possible with the equipment to be tested, before any work is performed.

When testing high voltage circuits, develop the habit of keeping one hand in your pocket or behind your back to minimize the hazard of accidental shock. It is also important to have a properly insulated floor covering to stand on while taking measurements. Be particularly careful to avoid contacting nearby metallic objects which could provide a ground return path. A good practice is to remove operating power before connecting test leads.

USING THE MODEL 1640

1. Turn the VOLTS control **2** to the full counterclockwise position. This assures that the output voltage of the Model 1640 is at the minimum (10.5 VDC).

2. Connect the Model 1640 outputs (+), (-), and (⏚) to the equipment being powered leads as follows:

   a. Connect the positive polarity input of the equipment being powered to the (+) terminal of the Model 1640.

   b. Connect the negative polarity input of the equipment to the (-) terminal of the Model 1640.

   c. If the negative terminal of the equipment is referenced to ground, jumper the (-) terminal to the (⏚) terminal **7**; if the positive terminal of the equipment is referenced to ground, jumper the (+) terminal to the (⏚) terminal **7**.

      If neither the positive or the negative terminal of the equipment requires grounding, connect a separate lead from the chassis of the equipment to the (⏚) terminal **7** of the Model 1640.

3. Connect the Model 1640 power cord to a 117 volt, 60 Hz AC outlet.

4. Turn on the Model 1640 by pushing up slide switch **1** to the ON position. The meter scale **3** will be illuminated.

5. Set VOLTS/AMPS meter switch **4** to VOLTS. Set VOLTS control **2** to the desired voltage by observing meter **5**. The Model 1640 output voltage is adjustable from 11V minimum to 15V maximum.

NOTE

Because of the excellent load regulation, the desired output voltage can be set with the VOLTS control **2**, and the VOLTS/AMPS meter switch may be left in AMPS position to monitor current without concern that the Model 1640 output voltage may change.

6. VOLTS/AMPS switch **4** to AMPS. The load current supplied to the equipment powered by the Model 1640 is indicated by meter **5**. The Model 1640 can supply a maximum continuous current of 3.0 amperes, and maximum surge current of 5 amperes for 40 milliseconds. When the continuous current demanded exceeds 3.0A the Model 1640 will shutdown automatically. The overload is then indicated by a lighted OVERLOAD INDICATOR **6**, and meter **5** will fall to zero.

7. To reset after shutdown, momentarily push the OFF/RESET switch **1** to the OFF position and back to the ON position. If the overload has been removed, the OVERLOAD INDICATOR **6** will turn off.

NOTES

The Model 1640 OVERLOAD INDICATOR cannot be reset until the continuous maximum output current demand is reduced to less than 3.0A.

When working with CB transceivers, always provide a dummy load for the transmitter while power is applied to avoid possible damage to the transmitter when keyed into an open circuit.

CIRCUIT THEORY (See Schematic)

A. VOLTAGE REGULATOR

Zener diode D1 biased by R6 provides a stable +6.2 VDC reference for the positive (non-inverting) input of IC1 operational amplifier. A sample of the output voltage between the + and - output binding posts is fed back to the negative (inverting input) of IC1 through the network composed of R5, R1 and R21. IC1 will maintain its two inputs (inverting and non-inverting) at equal potential by driving the base of Q4 (series pass-transistor) proportionally so that the potential on the arm of R21 is equal to the + voltage reference of D1.

R1 and R5 calibrating trimpots are set such that moving the arm of R21 fully counterclockwise sets the minimum output voltage to 10.5 VDC and moving the arm of R21 fully clockwise sets the maximum output voltage of the Model 1640 to 15.5 VDC.

B. OVERLOAD PROTECTION AND INDICATOR CIRCUITRY

The load current of the Model 1640 returns to V- through R20 (0.25Ω ±5%, 5W). This develops a voltage drop across this resistor which is equal to 0.875 VDC at 3.5 ADC. R3 is set to turn on Q2 through resistor R11 and the delaying capacitor C4 when the continuous output load current is greater than 3.0A. The regenerative turn-on of Q2 and Q1 pulls down the output of IC1 (pin 6) through R18 to V-. This shuts Q4 off. Whenever the output voltage on the + and - binding posts of the Model 1640 falls below 6.2 VDC, the OVERLOAD INDICATOR is forward biased from the 6.2 VDC of D1 through D2, R10, and S1 to V-. Therefore when Q4 is shut off by the OVERLOAD protection circuit, the OVERLOAD L.E.D. INDICATOR will light. RESET is accomplished by pushing S1 to the POWER OFF/RESET position which diverts current from Q1 and Q2 to V-.

Q3 limits the output load current surge of the Model 1640. During shorted loads or other fault conditions requiring more than 3.0A, Q3 limits the maximum output load current to 5A, until the voltage on C4 has risen to the turn-on voltage of Q2 to cause an overload shutdown.

MAINTENANCE

This power supply is constructed to provide long, trouble-free service and does not require periodic maintenance. If for any reason, the unit has been repaired and the calibration has been affected, perform the calibration required as outlined in the following procedure.

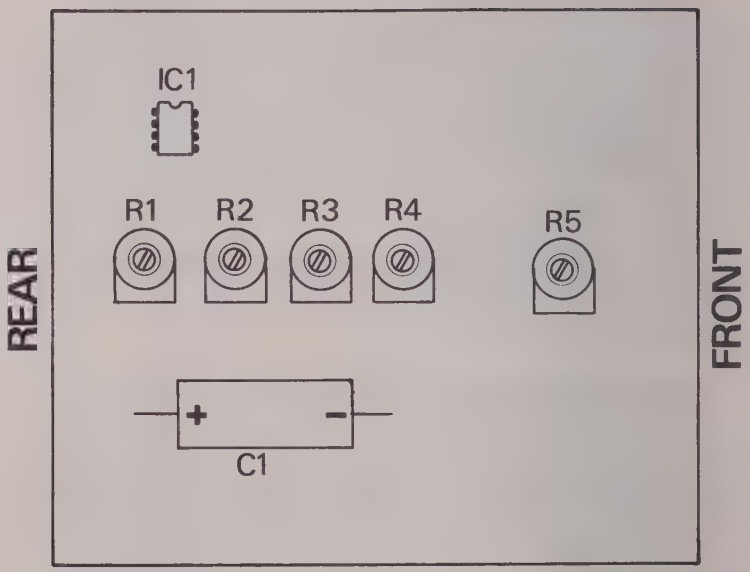


Fig. 2. Model 1640 printed circuit board, component view (calibrating trimpot locations shown).

CALIBRATION

To gain access to the calibration adjustments, remove the 6 screws at the sides of the top cover, then lift the top cover. Refer to Fig. 2 for locations of the calibration adjustments. A 0.100 inch hex type alignment plastic tool is required to turn the internal pot adjustments. Set Model 1640 POWER switch to the OFF/RESET position.

CAUTION

During ammeter and shutdown calibration, there is no OVERLOAD protection for the power supply, since the shutdown trimpot R3 on the board will be turned to one extreme position. Take care that the output terminals of the power supply are not accidentally shorted.

MINIMUM & MAXIMUM VOLTS OUTPUT CALIBRATION

1. Set R1, R5, and the front panel VOLTS control to full CCW position. (See Fig. 2.)

2. Connect an accurate calibrated voltmeter capable of 30 VDC full scale to the (+) and (−) output terminals of the Model 1640.

3. Set the Model 1640 power switch to the ON position. The voltmeter connected to Model 1640 output terminals should now read approximately +6.2 VDC.

4. Turn R5 MINIMUM OUTPUT ADJUST clockwise until the voltmeter reads 10.5 VDC.

5. Set the VOLTS control 2 to its full CW position.

6. Turn R1 MAXIMUM OUTPUT ADJUST clockwise until the voltmeter reads 15.5 VDC.

7. Set the VOLTS control 2 to its full CCW position. Check voltmeter for 10.5 VDC. If not, adjust R5 MINIMUM OUTPUT ADJUST for 10.5 VDC on the voltmeter.

8. Set the VOLTS control 2 to its full CW position. Check voltmeter for 15.5 VDC. If not, adjust R1 MAXIMUM OUTPUT ADJUST for 15.5 VDC on the voltmeter.

9. Repeat Steps 7 and 8 until the voltmeter reads 10.5 VDC and 15.5 VDC at the minimum and maximum settings of the VOLTS control 2.

VOLTMETER CALIBRATION (See Fig. 2)

NOTE

The MINIMUM AND MAXIMUM VOLTS OUTPUT CALIBRATION should precede this adjustment.

1. Turn R2 VOLTS CALIBRATION Trimpot full CCW.

2. Set VOLTS/AMPS switch to VOLTS position. Turn VOLTS control until the external voltmeter on the Model 1640 output terminals read 13.8 VDC.

3. Turn R2 VOLTS-CALIBRATION until voltmeter pointer of the Model 1640 reads 13.8 VDC.

AMMETER CALIBRATION (See Fig. 2)

1. Turn R4, R3 and VOLTS CONTROL to full CCW.

2. Set VOLTS/AMPS switch to AMPS position. Connect an accurate calibrated DC ammeter capable of 4A in series with an appropriate load (4Ω, 50W) to the output terminals of the power supply.

3. Starting from its full CCW position turn the VOLTS control clockwise for exactly 3.0A on the external ammeter.

4. Adjust AMMETER-CALIBRATION R4 until the Model 1640 ammeter 5 pointer indicates 3.0A.

SHUTDOWN ADJUSTMENT (See Fig. 2)
(Verify Ammeter is calibrated. See AMMETER Cal Section.)

1. Repeat Step 2 of the AMMETER Cal procedure.

2. Set the VOLTS control for exactly 3.5 amps on the external ammeter or the Model 1640 ammeter (if already calibrated).

3. Turn R3 OVERLOAD ADJ. trimpot slowly in CW direction until the OVERLOAD L.E.D. glows, (VOLTMETER or AMMETER pointer will drop to its mechanical zero position).

4. Turn the VOLTS control slightly CCW.

5. Momentarily push the POWER ON-OFF/RESET switch to the OFF/RESET position and back to ON position.

6. Check that the Model 1640 does not overload for currents of 3.0 amps. If so, repeat Step 3.

B & K-PRECISION MODEL 1640 PARTS LIST

488-157-9-002

SCHEMATIC SYMBOL	DESCRIPTION	B & K PART NUMBER
	RESISTORS & POTENTIOMETERS	
R20	0.25Ω, 5%, 5W W.W. Resistor	004-156-9-001
R21	5kΩ, ½W, Linear Potentiometer	008-255-9-001
	CAPACITORS	
C2	47 mfd, 16V, P.C. Electrolytic	022-089-9-001
C5	470 mfd, 25V, P.C. Electrolytic	022-095-9-001
C1	3400 mfd, 35V, Electrolytic	022-137-9-001
C4	47 mfd, 6.3V, P.C. Tantalum	027-013-9-001
	DIODES, TRANSISTORS AND IC's	
D4	1N67 (A) Germanium Diode	150-008-9-001
D3	1 amp, 600 V, Silicon Diode	151-018-9-001
D2	1N4148 Silicon Diode	151-038-9-001
D1	6.2V, 5%, 1W, Zener Diode	152-037-9-001
BR1	Silicon Bridge Rectifier	157-002-9-001
LED	Red L.E.D.	158-005-9-001
Q5	2N6383 Darlington Transistor	172-021-9-001
Q2,3,4	NPN Silicon Signal Transistor	176-051-9-001
Q1	PNP Silicon Signal Transistor	177-008-9-001
IC1	741C Operational Amplifier	307-016-9-001
	MISCELLANEOUS	
T1	Transformer	065-117-9-001
F1	2 amp, 3AG, Slow-Blow Fuse	190-121-3-002
M1	Meter	320-066-9-001
	Glamor Cap	384-015-9-001
	Instruction Manual	480-172-9-001
	Knob, 1" Skirted	751-115-9-001
	Plastic Standoff	759-059-9-001

COMPOSITE
499-079-9-001 B

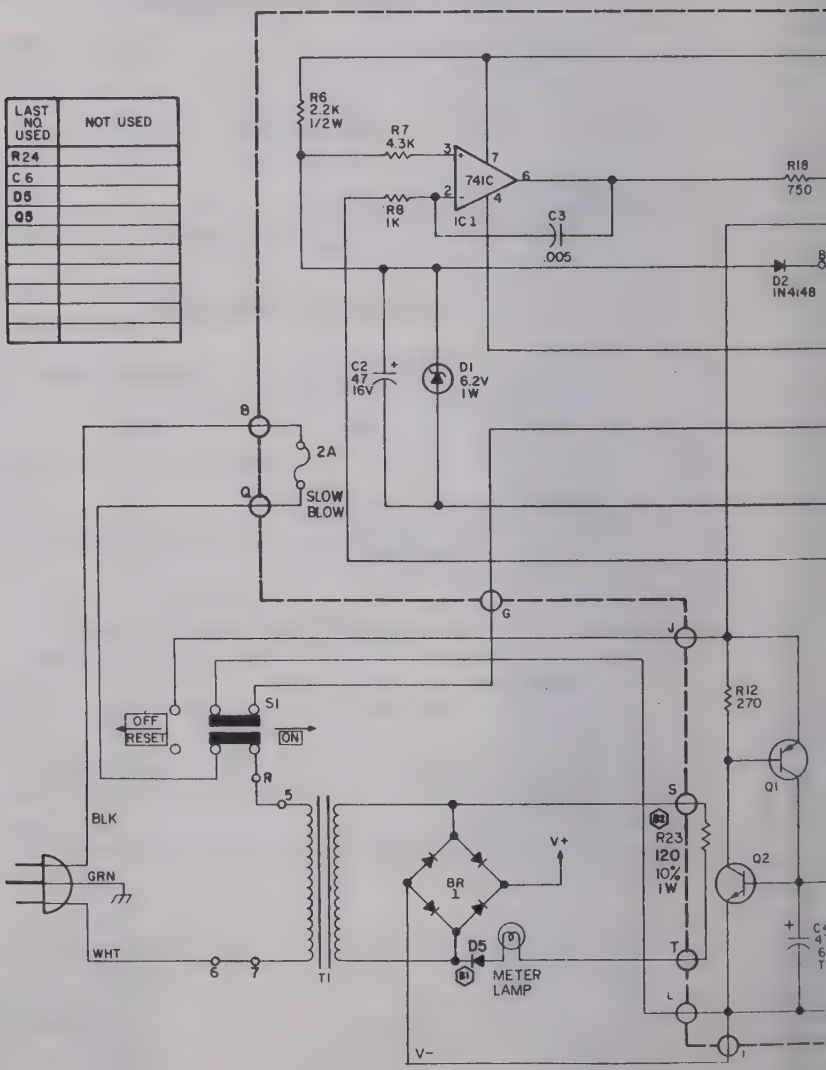
NOTES:

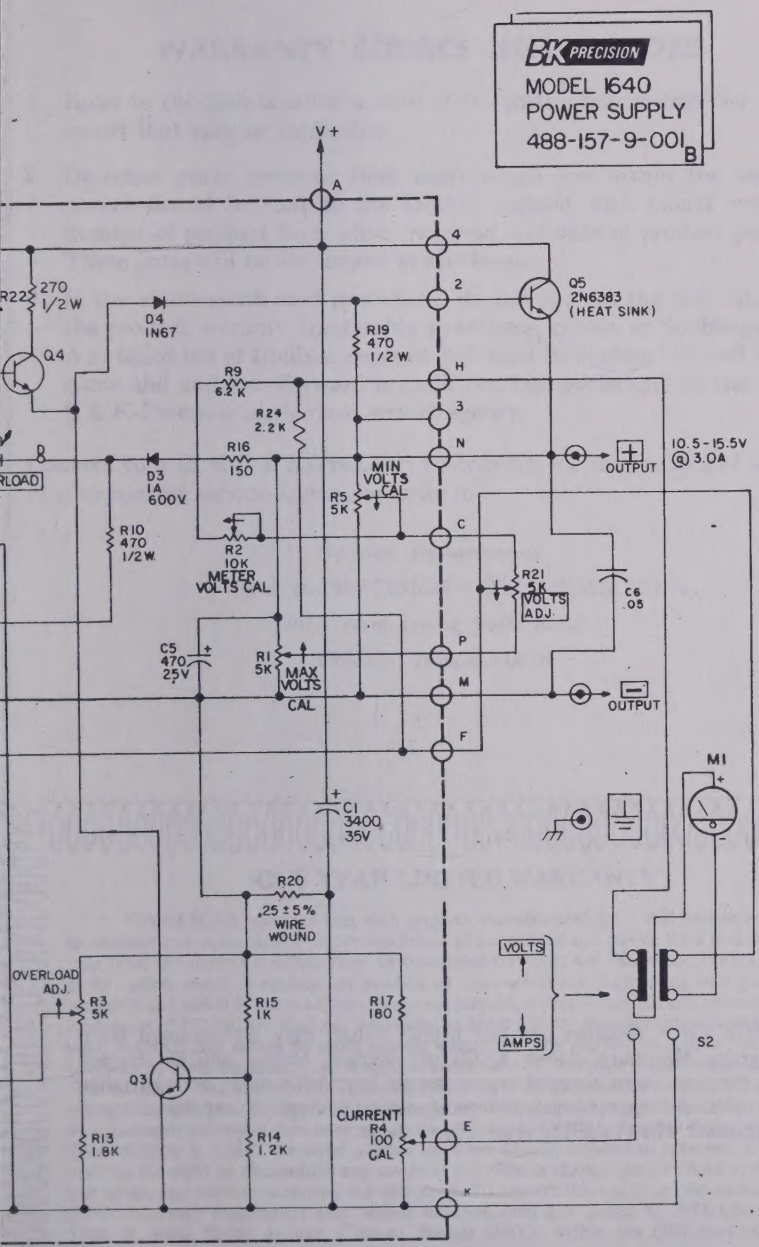
1. ALL RESISTORS ARE 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
2. ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.
3. TITLES IN RECTANGLES INDICATE FRONT PANEL NOMENCLATURE.
4. ALL CAPACITIES ARE SHOWN IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
5. THIS SCHEMATIC IS SUBJECT TO CHANGE WITHOUT NOTICE.
6. ABBREVIATIONS:

K = 1000 W = WATT uA = MICROAMPERE

⏚ = CASE GROUND TANT = TANTALUM

LAST NO. USED	NOT USED
R24	
C 6	
D5	
Q3	




B&K PRECISION
MODEL 1640
POWER SUPPLY
488-157-9-001 B
V+
A
4
2
H
3
N
C
P
M
F
E
K
R22 270 1/2 W
Q4
D4 1N67
R19 470 1/2 W
Q5 2N6383 (HEAT SINK)
R9 6.2 K
R24 2.2 K
R16 150
D3 1A 600V
MIN VOLTS CAL
R5 5K
R10 470 1/2 W
R2 10K METER VOLTS CAL
R21 5K VOLTS ADJ.
C6 .05
C5 470 25V
R1 5K MAX VOLTS CAL
OUTPUT
10.5 - 15.5V @ 3.0A
OUTPUT
M1
C1 3400 35V
R20 .25 ± 5% WIRE WOUND
OVERLOAD ADJ.
R3 5K
R15 1K
R17 180
VOLTS
AMPS
S2
Q3
CURRENT
R4 100 CAL
R13 1.8K
R14 1.2K

NOTE: Standard value resistors are not listed. Values may be obtained from schematic diagram. Minimum charge $5.00 per invoice. Orders will be shipped C.O.D. unless previous open account arrangements have been made or remittance accompanies order. Advance remittance must cover postage or express charges. Specify serial number when ordering replacement parts.

WARRANTY SERVICE INSTRUCTIONS

1. Refer to the maintenance section of the instruction manual for adjustments that may be applicable.
2. Defective parts removed from units which are within the warranty period should be sent to the factory prepaid with model and serial number of product from which removed and date of product purchase. These parts will be exchanged at no charge.
3. If the above-mentioned procedures do not correct the difficulty, pack the product securely (preferably in original carton or double-packed). A detailed list of troubles encountered must be enclosed as well as your name and address. Forward prepaid (express preferred) to the nearest B & K-Precision authorized service agency.

Contact your local B & K-Precision Distributor for the name and location of your nearest service agency, or write to

Service Department
B & K-PRECISION – DYNASCAN CORP.
2815 West Irving Park Road
Chicago, Illinois 60618

ONE YEAR LIMITED WARRANTY

"DYNASCAN warrants that each product manufactured by it will be free from defects in material and workmanship under conditions of normal use and service for a period of one (1) year from the date of purchase from an authorized DYNASCAN distributor. DYNASCAN will, at its option, repair or replace any product or component not conforming with the foregoing warranty and which is returned, transportation prepaid, to our factory or our authorized service contractor. *DYNASCAN shall not otherwise be liable for any damages, consequential or otherwise.* DYNASCAN makes no other express warranties. *Any implied warranties (including any warranty of merchantability) are limited in duration to (1) one year from the date of purchase.* This warranty does not apply to (i) damage resulting from unauthorized alterations and repairs, misuse, negligency or accident; or (ii) damage resulting from improper installation, connection or adjustment otherwise than in accordance with DYNASCAN's authorized Instruction Manual. This warranty is void if the serial number has been altered, defaced or removed. DYNASCAN reserves the right to discontinue any model at any time or change specifications or design without notice and without incurring any obligation. To register this warranty, the enclosed DYNASCAN warranty registration card should be completed and mailed to DYNASCAN CORP., 1801 W. Belle Plaine Avenue, Chicago, Illinois 60613, within ten (10) days after date of purchase.

B+K PRECISION

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